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it were, as the writer understands, expended without other compensation than the consciousness of making a noble contribution to knowledge, and the appreciation of his fellow astronomers of this and future generations."

PLANETARY PHENOMENA FOR JULY AND AUGUST, 1902.

By Malcolm McNeill.

July.

The Earth is in aphelion July 4th, 5 A. M. Pacific Time.

Mercury is a morning star, having passed inferior conjunction on June 23d. It reaches greatest west elongation on July 15th, and is well on toward superior conjunction by the end of the month. The conditions for visibility are not very good; but after the first week of the month the planet rises an hour or more before sunrise, and there is a possibility of seeing it in the morning twilight if the air is very clear.

Venus is the chief morning star, and throughout the month rises about two and one-half hours before the Sun. It moves about 35° eastward during the month from a position between the *Pleiades* and *Hyades* in *Taurus* to the middle of the constellation *Gemini,* west and south of *Castor and Pollux.* Its distance from the Sun diminishes about 5°.

Mars is also in the morning sky, but has not begun to brighten up very much. It moves about 20° eastward from the eastern part of *Taurus* into *Gemini,* and toward the close of the month is near *Venus,* a little to the north of the latter.

Jupiter will, at the end of the month, rise a little after sunset, and is therefore in fair position for late evening observation. It is in the eastern part of the constellation *Capricorn,* and is moving westward, the motion being about 3° during the month, and on a line a little south of the line of motion during the spring months.

Saturn comes to opposition with the Sun on July 17th, and is therefore above the horizon practically the entire night, during the month. It is in the western part of the constellation

Capricorn, and it moves a little more than 2° westward. It draws a little nearer *Jupiter,* but hardly enough to be noticeable without measurement. As seen in the telescope, the apparent minor axis of the rings will be much shorter than it was in 1901.

Uranus remains above the horizon until early morning. It moves about 1° westward in the constellation *Ophiuchus* and is, on July 1st, 1½° west and about 2° north of *θ Ophiuchi,* a third-magnitude star in the southern part of the constellation.

Neptune is very close to the Sun, a morning star, having passed conjunction on June 23d.

AUGUST.

Mercury is a morning star at the beginning of the month, rising about an hour before sunrise, but it rapidly nears the Sun and passes superior conjunction on August 11th, becoming an evening star. By the end of the month it has moved far enough away from the Sun to set nearly an hour and a half later; and it can therefore be seen in the evening twilight if the air is clear.

Venus is drawing nearer the Sun, and the time between the rising of the planet and that of the Sun shortens up nearly half an hour. The planet moves about 36° eastward from *Gemini* into *Cancer,* and lessens its distance from the Sun about 8° during the month.

Mars is increasing its apparent distance from the Sun, and by the end of the month rises at about 2 A. M. It moves eastward about 20° in the constellation *Gemini* and during the latter part of the month is south of the principal stars *Castor* and *Pollux,* at about the same distance from the nearer as the stars are from each other. The planet will not be very bright, but can readily be distinguished by its ruddy color. On August 1st *Mars* is in conjunction with *Venus.*

Jupiter comes to opposition on August 5th, and is therefore above the horizon practically the entire night. It is still in *Capricorn* and moves westward rather more than 3°.

Saturn is above the horizon until long after midnight. It is in the western part of *Capricorn* and moves westward about 2°. It approaches *Jupiter* about 2° during the month, their distance apart at the close of the month being about 18°.

Uranus is in the western sky in the evening, but is high enough for convenient observation until quite late. It changes its position only a little during the month, and it may still be found by its nearness to *θ Ophiuchi.* The planet is about a degree farther west of the star than it was on July 1st.

Neptune is farther away from the Sun than during July, but needs a telescope to show it.

JULY–AUGUST, 1902.

PHASES OF THE MOON, P. S. T.

New Moon . . .	July 5,	$4^{h}\ 59^{m}$ A.M.
First Quarter . . .	July 12,	4 47
Full Moon . . .	July 20,	8 45
Last Quarter . . .	July 27,	9 15 P.M.
New Moon . . .	Aug. 3,	12 17
First Quarter . . .	Aug. 10,	8 24
Full Moon . . .	Aug. 18,	10 3
Last Quarter . .	Aug. 26,	3 4 A.M.

THE SUN.

1902.	R. A.	Declination.	Rises.	Transits.	Sets.
July 1,	$6^{h}\ 38^{m}$	+23° 10′	$4^{h}\ 39^{m}$ A.M.	$12^{h}\ 3^{m}$ P.M.	$7^{h}\ 27^{m}$ P.M.
11,	7 19	+22 12	4 45	12 5	7 25
21,	7 59	+20 37	4 53	12 6	7 19
31,	8 39	+18 27	5 1	12 6	7 11
Aug. 10,	9 17	+15 47	5 10	12 5	7 0
20,	9 55	+12 41	5 19	12 3	6 47
30,	10 32	+ 9 15	5 29	12 1	6 33

MERCURY.

July 1,	5 20	+18 44	4 5 A.M.	11 16 A.M.	6 22 P.M.
11,	5 55	+19 52	3 30	10 41	5 52
21,	6 36	+21 50	3 24	10 43	6 2
31,	7 49	+21 49	3 58	11 16	6 34
Aug. 10,	9 15	+17 47	5 1	12 3 P.M.	7 5
20,	10 31	+10 58	6 1	12 39	7 15
30,	11 34	+ 3 24	6 52	1 3	7 14

VENUS.

July 1,	3 59	+18 38	2 19 A.M.	9 24 A.M.	4 29 P.M.
11,	4 48	+20 46	2 20	9 34	4 48
21,	5 38	+22 9	2 26	9 45	5 4
31,	6 29	+22 32	2 36	9 57	5 18
Aug. 10,	7 21	+21 53	2 50	10 9	5 28
20,	8 13	+20 11	3 10	10 21	5 32
30,	9 3	+17 31	3 31	10 32	5 33

MARS.

July	1,	5 3	+23 4	3 6 A.M.	10 29 A.M.	5 52 P.M.
	11,	5 33	+23 41	2 53	10 19	5 45
	21,	6 2	+23 56	2 41	10 9	5 37
	31,	6 32	+23 51	2 32	9 59	5 26
Aug.	10,	7 0	+23 26	2 23	9 48	5 13
	20,	7 28	+22 43	2 15	9 37	4 59
	30,	7 56	+21 43	2 7	9 25	4 43

JUPITER.

July	1,	21 16	−16 43	9 41 P.M.	2 43 A.M.	7 45 A.M.
Aug.	1,	21 2	−17 48	7 30	12 28	5 26
Sept.	1,	20 47	−18 52	5 13	10 6 P.M.	2 59

SATURN.

July	1,	19 51	−21 4	8 33 P.M.	1 18 A.M.	6 3 A.M.
Aug.	1,	19 41	−21 31	6 20	11 3 P.M.	3 46
Sept.	1,	19 34	−21 51	4 12	8 53	1 34

URANUS.

July	1,	17 10	−23 2	5 56 A.M.	10 33 P.M.	3 10 A.M.
Aug.	1,	17 6	−22 57	3 51	8 28	1 5
Sept.	1,	17 5	−22 56	1 48	6 25	11 2 P.M.

NEPTUNE.

July	1,	6 6	+22 21	4 11 A.M.	11 32 A.M.	6 53 P.M.
Aug.	1,	6 11	+22 20	2 14	9 35	4 56
Sept.	1,	6 15	+22 18	12 15	7 36	2 57

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off left-hand limb before August 5, off right-hand limb afterward, as seen in an inverting telescope.)

I, D,	July	1,	1^{h} 40^{m}A.M.	I, D,	Aug.	1,	10^{h} 15^{m}P.M.
I, D,		2,	8 9 P.M.	I, D,		3,	4 44
II, D,		3,	8 26	I, R,		9,	2 26 A.M.
I, D,		8,	3 34 A.M.	I, R.		10,	8 55 P.M.
I, D,		9,	10 3 P.M.	II, R,		12,	1 29 A.M.
II, D,		10,	11 0	III, R,		12,	4 51 P.M.
III, D,		14,	9 17	I, R,		17,	10 50
I, D,		16,	11 57	I, R,		19,	5 18
II, D,		18,	1 35 A.M.	III, R,		19,	8 51
I, D,		18,	6 26 P.M.	II, R,		22,	5 22
III, D,		21,	1 17 A.M.	I, R,		25,	12 45 A.M.
I, D,		24,	1 52	I, R,		26,	7 13 P.M.
II, D,		25,	4 10	III, R,		27,	12 53 A.M.
I, D,		25,	8 21 P.M.	IV, D,		29,	6 0 P.M.
II, D,		28,	5 27	II, R,		29,	7 58
I, D,		31,	3 47 A.M.	IV, R,		29,	10 43